

Application No. 10/649,164
Paper Dated: November 29, 2006
In Reply to USPTO Correspondence of October 20, 2006
Attorney Docket No. 4316-031612

APPEAL BRIEF
Expedited Procedure
Examining Group 1725

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

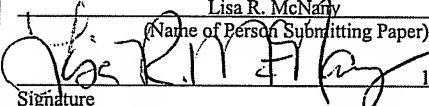
Application No. : 10/649,164 Confirmation No. : 4762
Applicants : David James Beale et al.
Filed : August 27, 2003
Title : ALUMINUM INGOT CASTING MACHINE
Group Art Unit : 1725
Examiner : Len Tran
Customer No. : 28289

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APPELLANT'S BRIEF UNDER 37 C.F.R. §41.37

This Appeal Brief is submitted in support of the Notice of Appeal filed September 29, 2006.

The headings used hereinafter and that which is set forth under each heading are in accordance with 37 C.F.R. §41.37(c)(1).

I hereby certify that this correspondence is being submitted electronically to the United States Patent and Trademark Office on November 29, 2006.	
Lisa R. McNamara (Name of Person Submitting Paper)	
 Signature	11/29/2006 Date

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Appendix A

Appendix B

(i) **REAL PARTY IN INTEREST**

The real party in interest in the present appeal is Outokumpu Oyj, a corporation of Riihitontuntie 7, 02200 ESPOO, Finland. The application was originally assigned by the inventors to Outokumpu Oyj by way of an assignment executed on July 16, 2003, and recorded in the U.S. Patent and Trademark Office at reel and frame number 014445/0154 on August 27, 2003.

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(ii) **RELATED APPEALS AND INTERFERENCES**

There are no appeals or interferences known to Applicant, Applicant's legal representative, or Assignee, which will directly affect, or be directly affected by or having a bearing on, a decision in the present appeal.

(iii) **STATUS OF CLAIMS**

Claims 1, 3-5, 8-11, 13-17, 19-45 and 62-69 are pending in the present application and are the subject of this appeal.

Claims 2, 6-7, 12, 18, and 46-61 have been cancelled and are not at issue in this appeal.

Claims 62-65 have been indicated as being allowable.

Claims 21-26, 31-34, 36, and 38 have been objected to as being dependent upon a rejected base claim, but have been indicated as being allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 1, 3-5, 8-10, and 66-69 stand finally rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over U.S. Patent No. 4,589,467 to Hunter.

Claims 11, 13-16, 28-30, 35, 37, and 39-45 stand finally rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over U.S. Patent No. 4,589,467 to Hunter in view of U.S. Patent No. 3,972,368 to Kikkawa et al.

Claims 17, 19-20, and 27 stand finally rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over U.S. Patent No. 4,589,467 to Hunter in view of U.S. Patent No. 3,200,451 to Worswick.

(iv) **STATUS OF AMENDMENTS**

An Amendment and Request for Reconsideration After Final was filed June 29, 2006. This Amendment proposed that independent claims 1 and 66 be amended to include the clarification that the claimed rotatable annular ring be further defined as substantially hollow. Appellants proposed this language clarification to explicitly recite the definition of the term “annular ring” set forth in the specification, as per MPEP 2173.05(a). Note the specification at page 16, lines 18-19 that states “In this specification “annular” means substantially hollow.”

This Amendment was not entered as the Examiner stated that such clarification of the claim language would raise new issues that would require further consideration and/or search and would not place the application in better form for appeal by materially reducing or simplifying the issues for appeal.

(v) **SUMMARY OF CLAIMED INVENTION**

To follow is a summary of the claims currently under appeal. In accordance with the claimed invention, there is provided a casting ring which is fully supported from below and in which the space inside the ring is clear so that it is available for use for purposes other than simply supporting the casting ring.

Specifically, independent claim 1 of the invention provides for an aluminum ingot casting machine comprising a source of molten metal 14, 16, a rotatable annular ring 32, defining a space inside the ring and having a generally vertical axis of rotation and being sized and shaped to carry a plurality of ingot casting molds 85 (Specification, page 16, line 17-page 17, line 8) the annular ring comprising a mold-carrying carousel and a support structure supporting the carousel, the support structure comprising an inner and an outer circular rail 88, 86 and a drive means 47, located substantially outside the space, for indexing the molds to the source of molten metal by rotating the annular ring, the drive means comprising a drive gear means fixed to one of the circular rails 88, 86, and a drive sprocket 100 for driving the drive gear means (Specification-page 15, line 26-page 27, line 16). Independent claim 66 differs from claim 1 in that the drive gear means is fixed to the carousel 32.

Independent claim 11 corresponds with claims 1 and 66 in that it provides for an aluminum ingot casting machine comprising a source of molten metal, a rotatable annular ring and a drive means as specified in claims 1 and/or 66. Claim 11 differs from claims 1 and 66 in that the source of molten metal comprises at least two pivoting crucibles 14, 18 to permit continuous pouring of molten aluminum. Claim 11 also includes the limitation of a Y-shaped launder 20 having first and second receiving portions 24, 22 for receiving molten metal, the first receiving portion being positioned to receive molten metal from one of the crucibles and the second receiving portion being positioned to receive molten metal from another of the crucibles. The launder further comprises a molten metal delivery portion 26 extending between the receiving portions and the carousel 32. (Specification, page 5, lines 15-30 and page 6, lines 12-16).

Dependent claim 17, which is separately rejected by the Examiner, provides for a water sprayer cooling system 45 located below the annular ring 32, the cooling system including a

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plurality of nozzles 106 for spraying water onto the molds 85. (Specification, page 17, lines 8-14 and Figure 5).

(vi) **GROUND OF REJECTION TO BE REVIEWED ON APPEAL**

- A. *Whether claims 1, 3-5, 8-10, and 66-69 are patentable under 35 U.S.C. §103(a) over the teachings of U.S. Patent No. 4,589,467 to Hunter.*
- B. *Whether claims 11, 13-16, 28-30, 35, 37, and 39-45 are patentable under 35 U.S.C. §103(a) over the combination of U.S. Patent No. 4,589,467 to Hunter in view of U.S. Patent No. 3,972,368 to Kikkawa et al.*
- C. *Whether claims 17, 19-20, and 27 are patentable under 35 U.S.C. §103(a) over the combination of U.S. Patent No. 4,589,467 to Hunter in view of U.S. Patent No. 3,200,451 to Worswick.*

(vii) ARGUMENT

I. BACKGROUND OF THE INVENTION:

Typical continuous aluminum ingot casting machines take the form of a circular casting ring or carousel supporting a plurality of molds, to permit continuous filling, removal and refilling of the plurality of ingot forming molds. The casting ring or carousel is, in turn, supported from a central axle having radial arms supporting the casting ring or carousel. The casting ring or carousel is typically driven from this center axle. (Specification-page 1, lines 21-25 and lines 28-29). Several disadvantages are present with this design. The first of these disadvantages is that the use of a central axle with arms supporting the ring requires very strong arms to support the cantilevered load of filled molds. This requires a significant amount of structural support, which also adds to the overall weight of the carousel. The heavier the carousel, the harder it is to make it rotate smoothly and the more powerful a drive is required. Additionally, the larger the ring, the more difficult it becomes to stop and start the ring as each mold is indexed to the next station. Another disadvantage of previously used, center/arm supported carousels, is that the placement of these arms or spokes inside the ring renders this space largely unusable. Thus, the carousel cannot be placed in a location where building columns would interfere with the rotation of the arms. Also, the components of the ring are not accessible from inside the ring for maintenance and operational purposes, thus reducing the flexibility of the machine. Furthermore, it is often useful to be able to position some system components, such as water piping for the ingot cooling means, inside the ring. However, the positioning of components inside the ring is made awkward and impractical by reason of the movement of the arms. (Specification-page 2, lines 6-25).

II. INSTANT INVENTION:

The claimed invention is directed to an aluminum ingot casting machine comprising a source of molten metal, a rotatable annular ring defining a space inside, and a drive means located substantially outside the inside ring space for indexing ingot casting molds to the source of molten metal by rotating the annular ring. The annular ring has a generally vertical axis of rotation and is sized and shaped to carry a plurality of the ingot casting molds. Moreover, the annular ring defines a space inside of the ring, with the ring being substantially hollow. In particular, independent claims 1, 11, and 66 recite an "annular ring", and the specification states at page 16, line 17 to page 17, line

5, that “‘annular’ means substantially hollow...meaning, *inter alia*, that no central drive arms rotate through the space inside the ring”. Section I of MPEP 2173.05(a) states “When the specification states the meaning that a term in the claim is intended to have, the claim is examined using that meaning, in order to achieve a complete exploration of the applicant’s invention and its relation to the prior art.”. Accordingly, the claims recite an annular ring which defines a space inside of the ring which, when interpreted in light of the specification, defines a ring that is substantially hollow, including no ring elements within the space inside the ring. Such an open annular ring is discussed in the specification at the above passages as providing specific features to the invention, such as providing easy access from inside of the ring, such as for maintenance, without impediment, and allowing for the placement of the machine in a building having columns located inside the ring. Other advantages associated with the use of the annular ring of the invention include the reduction in weight of the device allowing for smooth rotation of the ring and easier mold indexing capability. Another advantage of the annular ring design of the invention is the availability of space defined by the ring for the placement of system components such as water piping for the ingot cooling means.

III. REJECTIONS/ARGUMENTS:

A. U.S. Patent No. 4,589,467 to Hunter fails to disclose or suggest the annular ring defining a space inside of the ring, as defined by claims 1, 3-5, 8-10, and 66-69.

In order to establish a *prima facie* case of obviousness, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one skilled in the art, to modify the reference or combine reference teachings, and there must be a reasonable likelihood of success in doing so. *See* MPEP § 2143. An obviousness rejection is proper only if the prior art, coupled with the knowledge generally available at the time of the invention, contained some suggestion or incentive that would have motivated the skilled artisan to combine the references and that there would be a reasonable expectation of success in doing so. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991); *See also Karsten Mfg. Corp. v. Cleveland Gulf Co.*, 242 F.3d 1376, 1385, 58 USPQ2d 1286, 1293 (Fed. Cir. 2001); *McGinley v. Franklin Sports, Inc.*, 262 F.3d 1339, 1351, 60 USPQ2d 1001, 1008 (Fed. Cir. 2001).

The final Office Action alleges that Hunter discloses a casting machine comprising a source of molten metal, a rotatable annular ring, shaped to carry a plurality of ingot casting molds, with inner and outer rails, as well as drive means including gears and a sprocket, wherein the drive sprocket can be driven by an AC motor.

Hunter, however, fails to teach or suggest an annular ring defining a space inside of the ring as required by independent claims 1 and 66, i.e. an annular ring that is substantially hollow.

In particular, as seen in Figure 13 and described at col. 8, line 35 of Hunter, the carousel of Hunter does not define a space inside of the ring that is substantially hollow. Instead, the inside of the ring of Hunter contains operational components, including a pneumatic cylinder 100 mounted across the space in the middle of the ring, and additional structure within the interior of the carousel ring (which is labeled "A" in the copies of Figures 13 and 14 provided with this Appeal Brief and labeled *Appendices "A" and "B"*) which appears to represent a large portion of the drive mechanism of Hunter. With such structures present within the interior space of the carousel ring, the carousel ring of Hunter is clearly not an annular ring defining a space inside of the ring, as explicitly defined by independent claims 1 and 66.

Moreover, the inclusion of such components within the carousel ring of Hunter teaches away from the present invention, which claims an annular ring defining a space inside of the ring. When considering a reference, it is necessary to consider those portions of the reference that teach away from the claimed invention. *Bausch & Lomb, Inc. v. Barnes-Hind/Hydrocurve, Inc.*, 796 F.2d 443, 230 USPQ 416 (Fed. Cir. 1986). When interpreting the patentability of a claim, the law requires that a reference be considered for all of its teachings, including disclosure that diverges and teaches away from the invention at hand as well as disclosures that point toward and teach the invention. *In re Dow Chem. Co.*, 837 F.2d 469, 5 USPQ2d 1529 (Fed. Cir. 1988). As noted above, Hunter demonstrates operational components inside of the ring. The use of such operational elements, including the pneumatic cylinder 100 of Hunter, teaches away from the present invention, which claims an annular ring defining a space, and therefore void of such operational components. Accordingly, it is apparent that Hunter does not disclose, nor reasonably suggest, the substantially hollow annular ring defining a space inside the ring, as required by claims 1 and 66 and specifically

teaches away from such an arrangement. The rejection based on Hunter is therefore improper and the rejection of the claims based on Hunter should therefore be reversed.

B. The combination of U.S. Patent No. 4,589,467 to Hunter in view of U.S. Patent No. 3,972,368 to Kikkawa et al. fails to disclose or suggest the launder arrangement set forth in claims 11, 13-16, 28-30, 35, 37, and 39-45.

With respect to independent claim 11 and the rejections based on the combination of Hunter and Kikkawa, Kikkawa is cited merely for disclosing a Y-shaped launder and a skimming apparatus for scraping dross off molten metal. Independent claim 11, however, defines a Y-shaped launder with first and second receiving portions for receiving molten metal. The first receiving portion is positioned to receive molten metal from one crucible, and the second receiving portion is positioned to receive molten metal from another crucible, with a delivery portion extending between these receiving portions to the carousel. As such, two separate sources of molten metal (at the two top legs of the "Y") feed into a single mold position (at the bottom leg of the "Y"). Applicants describe these features on page 5, lines 20 - 25, on page 14, line 31, and in Figures 1, 2, and 3 of the application.

Kikkawa, on the other hand, teaches tilting crucibles which are connected in series to a single source launder that delivers molten metal to two separate mold positions on the mold, as shown in Figures 5-7 of Kikkawa. In other words, Kikkawa teaches feeding from the single leg of a "Y" into the two other ends of the "Y". In essence, Kikkawa teaches the exact opposite of the invention of claim 11, by teaching a single feed source to two separate molds as opposed to two separate feed sources for a single mold. The Examiner has failed to consider these claim limitations, which are not disclosed anywhere in Kikkawa.

Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so. *In re Kahn*, 441 F.3d 977, 986, 78 USPQ2d 1329, 1335 (Fed. Cir. 2006). Clearly Hunter and Kikkawa, whether considered alone or in combination, fail to disclose or suggest such an arrangement involving two receiving portions feeding to a single delivery portion as opposed to one receiving portion feeding into two delivery portions. Accordingly, the rejection of claim 11 and the

dependent claims depending therefrom should be reversed. It should also be noted that claim 11 also includes the limitation of an annular ring defining a space inside the ring. As discussed in detail above with respect to claims 1 and 66, Hunter fails to teach an annular ring defining a space inside the ring.

C. The combination of U.S. Patent No. 4,589,467 to Hunter in view of U.S. Patent No. 3,200,451 to Worswick fails to disclose or suggest the water sprayer arrangement set forth in claims 17, 19-20, and 27.

Worswick has been combined with Hunter in rejecting dependent claims 17, 19-20 and 27 of the application, merely for its alleged teachings with respect to a water sprayer. Worswick fails to add anything to the deficient teachings of Hunter as already described above. Moreover, Worswick fails to describe Applicants' plurality of nozzles for spraying water onto the molds, as recited in claim 17. In contrast to Applicants' claimed invention, Worswick is limited to circulating water into a space within the mold under the ingot as explained at column 2, lines 9-14 of Worswick. Thus, the obviousness rejections based on Hunter in view of Worswick should also be reversed.

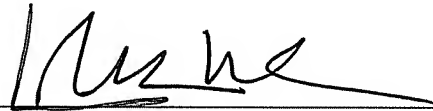
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(viii) **CONCLUSION**

In view of the above considerations, and regarding the rejections of claims 1, 3-5, 8-11, 13-17, 19-20, 27-30, 35, 37, 39-45 and 66-69, it is respectfully submitted that the Examiner erred in finally rejecting these claims under 35 USC §103(a) as being allegedly unpatentable over U.S. Patent No. 4,589,467 to Hunter whether considered alone or in combination with U.S. Patent No. 3,972,368 to Kikkawa et al. or U.S. Patent No. 3,200,451 to Worswick. Appellant therefore respectfully urges that the Examiner's final rejection of these claims be reversed.

Respectfully submitted,

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(ix) **CLAIM APPENDIX**

Claim 1. An aluminum ingot casting machine comprising:

a source of molten metal;

a rotatable annular ring, said ring defining a space inside said ring, said annular ring having a generally vertical axis of rotation and being sized and shaped to carry a plurality of ingot casting molds, the annular ring comprising a mold-carrying carousel and a support structure supporting the carousel, the support structure comprising an inner and an outer circular rail; and

a drive means, located substantially outside said space, for indexing said molds to said source of molten metal by rotating said annular ring, the drive means comprising a drive gear means fixed to one of said circular rails, and a drive sprocket for driving said drive gear means.

Claim 2. (Cancelled).

Claim 3. An aluminum ingot casting machine as claimed in claim 1 wherein the support structure further includes a plurality of floor mounted support rollers to support said circular rails.

Claim 4. An aluminum ingot casting machine as claimed in claim 1 wherein the inner and outer circular rails comprise a floor-mounted inner and a floor-mounted outer circular rail, and wherein the support structure further comprises a plurality of rollers, supported by said rails, supporting said carousel.

Claim 5. An aluminum ingot casting machine as claimed in claim 4 wherein said drive means acts between said floor and said carousel, to rotate said annular ring on said support structure.

Claim 6 (Cancelled).

Claim 7 (Cancelled).

Claim 8. An aluminum ingot casting machine as claimed in claim 1 wherein the drive gear means comprises a series of cam followers.

Claim 9. An aluminum ingot casting machine as claimed in claim 1 wherein said drive sprocket is powered by an AC electric motor.

Claim 10. An aluminum ingot casting machine as claimed in claim 9 wherein said motor is controlled by a variable frequency controller.

Claim 11. An aluminum ingot casting machine comprising:

a source of molten metal, the source of molten metal comprising at least two pivoting crucibles to permit continuous pouring of molten aluminum;

a rotatable annular ring, said ring defining a space inside said ring, said annular ring having a generally vertical axis of rotation and being sized and shaped to carry a plurality of ingot casting molds;

a drive means, located substantially outside said space, for indexing said molds to said source of molten metal by rotating said annular ring; and

a Y-shaped launder, the launder having first and second receiving portions for receiving molten metal, the first receiving portion being positioned to receive molten metal from one of said crucibles and the second receiving portion being positioned to receive molten metal from another of said crucibles, the launder further comprising a molten metal delivery portion extending between the receiving portions and the carousel.

Claim 12 (Cancelled).

Claim 13. An aluminum ingot casting machine as claimed in claim 11 further including a pivoting tundish.

Claim 14. An aluminum ingot casting machine as claimed in claim 13 wherein said pivoting tundish includes a ceramic nozzle for under pouring said molten metal in said molds.

Claim 15. An aluminum ingot casting machine as claimed in claim 14 wherein said tundish pivots between a lower pouring position and a raised non-pouring position.

Claim 16. An aluminum ingot casting machine as claimed in claim 15 further including an automatic skimming apparatus.

Claim 17. An aluminum ingot casting machine as claimed in claim 1 further including a water sprayer cooling system located below said annular ring, the cooling system including a plurality of nozzles for spraying water onto said molds.

Claim 18 (Cancelled).

Claim 19. An aluminum ingot casting machine as claimed in claim 17 wherein said annular ring includes a steam retaining skirt extending downwardly therefrom.

Claim 20. An aluminum ingot casting machine as claimed in claim 17 wherein said nozzles are located above a water tray located beneath the annular ring.

Claim 21. An aluminum ingot casting machine as claimed in claim 20 wherein said water tray includes an upstanding side wall which is curved in plan view to follow said annular ring and said water tray includes a certain level of water therein.

Claim 22. An aluminum ingot casting machine as claimed in claim 21 wherein said steam retaining skirt extends below said level of water contained within said water tray wherein steam is trapped below said annular ring by said steam retaining skirt.

Claim 23. An aluminum ingot casting machine as claimed in claim 22 wherein said water tray includes end walls which define a water free region below said annular ring, said water free region being sized and shaped to permit the pouring and skimming of ingots.

Claim 24. An aluminum ingot casting machine as claimed in claim 23 wherein said end walls include slots to permit said steam retaining skirt to pass through said end walls.

Claim 25. An aluminum ingot casting machine as claimed in claim 24 wherein said slots are sized and shaped to control an amount of water that escapes from said water tray through said slots.

Claim 26. An aluminum ingot casting machine as claimed in claim 25 further including a collection tray to capture water which escapes from said slot for recirculation.

Claim 27. An aluminum ingot casting machine as claimed in claim 17 wherein said water spray cooling system is sized to permit different amounts of cooling to be provided at different positions around said annular ring.

Claim 28. An aluminum ingot casting machine as claimed in claim 11 wherein said crucibles are removably placed in tilter frames.

Claim 29. An aluminum ingot casting machine as claimed in claim 28 wherein said tilter frames include latches to retain the crucibles to the tilter frames when in use.

Claim 30. An aluminum ingot casting machine as claimed in claim 28 wherein said tilter frames include actuators to tilt the crucibles to pour molten metal into said launder.

Claim 31. An aluminum ingot casting machine as claimed in claim 28 wherein said tilter frames further include an encoder to measure a tilt position of said crucibles.

Claim 32. An aluminum ingot casting machine as claimed in claim 31 further including an automatic control for tilting said crucibles in a controlled manner for pouring, based on said position encoder.

Claim 33. An aluminum ingot casting machine as claimed in claim 32 wherein said controlled manner pouring includes having an adjustor to vary a speed of tilting said crucibles to ensure an even rate of pour of molten metal into said molds.

Claim 34. An aluminum ingot casting machine as claimed in claim 32 further including a manual control to allow an operator to tilt a crucible to a pouring point before turning on the automatic control.

Claim 35. An aluminum ingot casting machine as claimed in claim 28 wherein one crucible is larger than the other crucible.

Claim 36. An aluminum ingot casting machine as claimed in claim 28 wherein said tilting frame automatically returns to an untilted position in the event of a loss of power.

Claim 37. An aluminum ingot casting machine as claimed in claim 29 wherein said latches include a safety switch to prevent said automatic controller from moving the tilter frames if said latches are not secured.

Claim 38. An aluminum ingot casting machine as claimed in claim 32 wherein said automatic control causes a second crucible to start pouring upon said first crucible being finished to ensure a substantially continuous flow of molten metal.

Claim 39. An aluminum ingot casting machine as claimed in claim 16 wherein said skimming apparatus is sized and shaped to remove dross from a surface of each poured ingot, immediately after each ingot is poured.

Claim 40. An aluminum ingot casting machine as claimed in claim 39 wherein said skimming apparatus is located at a station adjacent to where said molds are poured, in the direction of rotation of said annular ring.

Claim 41. An aluminum ingot casting machine as claimed in claim 40 wherein said skimming apparatus includes a replaceable spatula for skimming said dross.

Claim 42. An aluminum ingot casting machine as claimed in claim 41 wherein said station further includes at least one skim pot for discharging said skimmed dross from said spatula.

Claim 43. An aluminum ingot casting machine as claimed in claim 42 further including a proximity switch for detecting the presence of a mold requiring skimming.

Claim 44. An aluminum ingot casting machine as claimed in claim 42 wherein there are at least two skim pots with level sensors, and said skimming apparatus fills first one then the other of said skim pots to permit a full skim pot to be removed and emptied.

Claim 45. An aluminum ingot casting machine as claimed in claim 44 further including a preheater to preheat the spatula prior to skimming.

Claims 46-61 (Cancelled).

Claim 62. An aluminum ingot casting machine comprising:

a source of molten metal;

a rotatable annular ring, said ring defining a space inside said ring, said annular ring having a generally vertical axis of rotation and being sized and shaped to carry a plurality of ingot casting molds;

a drive means, located substantially outside said space, for indexing said molds to said source of molten metal by rotating said annular ring;

a demolder means for transferring ingots from said molds and a cooling line for cooling ingots, positioned to receive said ingots from said demolder means, said cooling line including:

a conveyer for moving said ingots along said cooling line;

a cooling tunnel for enclosing said conveyer;

a source of cooling water to spray said ingots moving within said cooling tunnel; and

a countercurrent air flow to provide additional heat exchange with said cooling ingots.

Claim 63. A machine as claimed in claim 62 wherein said conveyer is a walking beam conveyer, having a walking rail and a stationary rail.

Claim 64. A machine as claimed in claim 63 wherein said walking rail is moved by a hydraulic actuator.

Claim 65. A machine as claimed in claim 62 wherein said cooling line further includes entrance and exit air knives on said cooling tunnel for removing extraneous matter from said ingots.

Claim 66. An aluminum ingot casting machine comprising:

a source of molten metal;

a rotatable annular ring, said ring defining a space inside said ring, said annular ring having a generally vertical axis of rotation and being sized and shaped to carry a plurality of ingot casting molds, the annular ring comprising a mold-carrying carousel and a support structure supporting the carousel, the support structure comprising an inner and an outer circular rail; and

a drive means, located substantially outside said space, for indexing said molds to said source of molten metal by rotating said annular ring, the drive means comprising a drive gear means fixed to said carousel, and a drive sprocket for driving said drive gear means.

Claim 67. An aluminum ingot casting machine as claimed in claim 66 wherein the support structure further includes a plurality of floor mounted support rollers to support said circular rails.

Claim 68. An aluminum ingot casting machine as claimed in claim 66 wherein the inner and outer circular rails comprise a floor-mounted inner and a floor-mounted outer circular rail, and wherein the support structure further comprises a plurality of rollers, supported by said rails, supporting said carousel.

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Claim 69. An aluminum ingot casting machine as claimed in claim 68 wherein said drive means acts between said floor and said carousel, to rotate said annular ring on said support structure.

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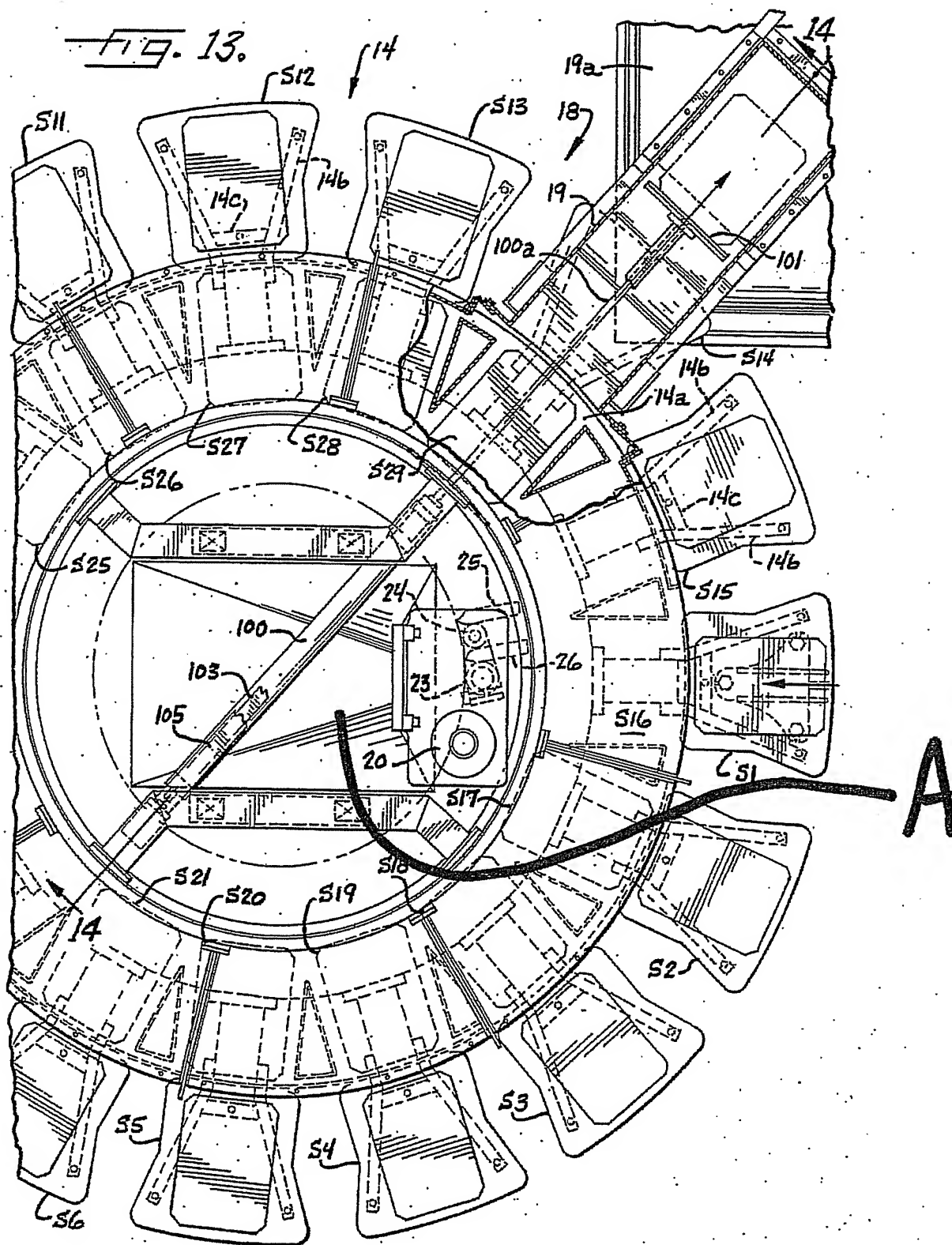
(x) **EVIDENCE APPENDIX PAGE(S)**

NONE

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(xi) **RELATED PROCEEDING APPENDIX PAGE(S)**

NONE



U.S. Patent

May 20, 1986.

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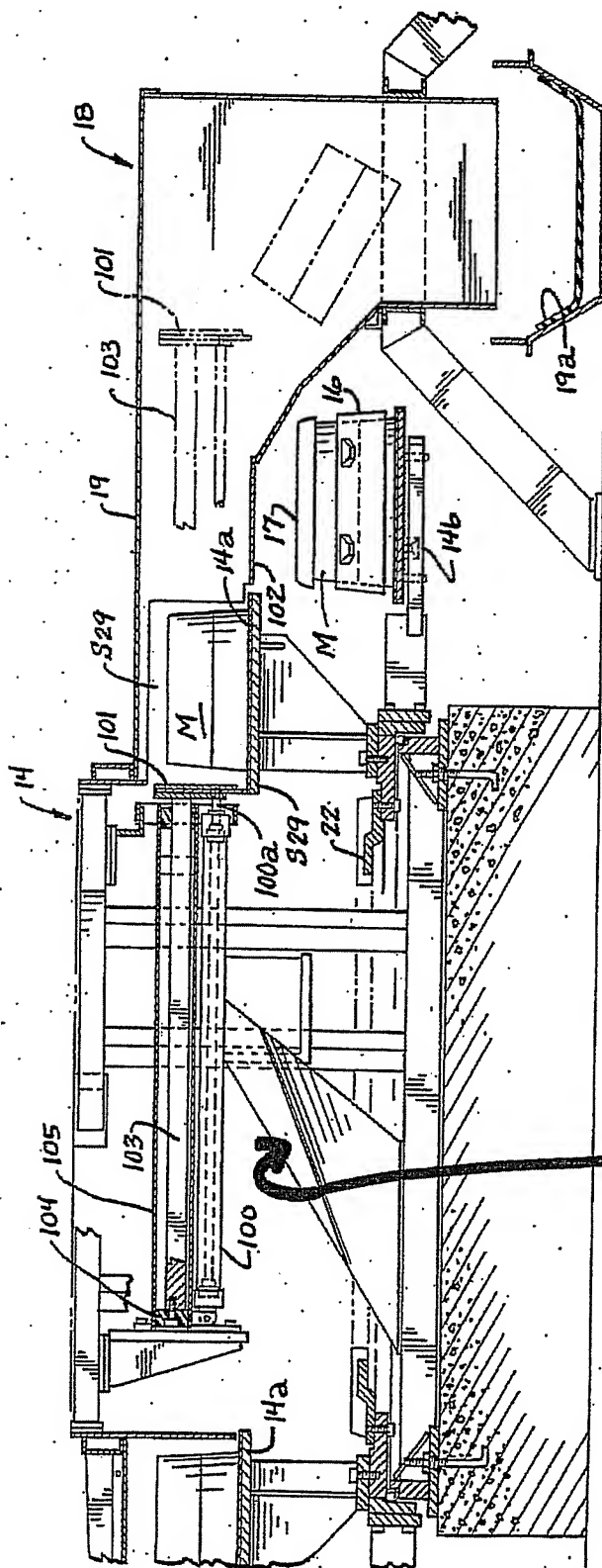


FIG. 14.

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